IC7.4: Optional Job Sheet

Diagnosing Unexpected Precipitation Areas

Introduction:

Objective: Building off knowledge gained in the IC 7 Lesson 4 training module, examine a winter weather precipitation event and diagnose the reasons for higher than expected snowfall amounts.

Data: 13 February 2004 winter weather event across northwest Texas and southern Oklahoma. You will be using AWIPS D2D for this exercise. **Procedures are available with this case if you wish to use them.** All procedures will be listed in bold in the instructions of this jobsheet.

Instructions:

Load the 13Feb2004 Winter Weather AWOC case on your WES machine in case review mode, using the OUN localization. Set clock to 06 UTC 14 February 2004

Synoptic Overview and Review of Current Forecast:

Load the procedure set called **"IC7Lesson4"** and load in the first entry **"4panel Syn Overview"**. If you choose to load the products on your own, load the following into a 4-panel regional scale layout:

1. 500 mb height and winds;
2. 700 mb height and omega;
3. 850 mb height, wind, temp; and
4. mslp and surface winds.

In another pane, load the procedure from IC7Lesson4 called **"QG forcing Precip accum"** which loads in a 4-panel display:

1. NAM80 500 mb height and 1000-500 mb RH;
2. 700 mb height and 700-500 mb Div-Q;
3. Select isentropic surface that is just below or near 700mb, and load Pressure, Wind, and specific humidity on that isentropic surface; and
4. MSLP and 6 hr accumulated precip.
5. You will want to overlay Div-Q in the 500-300 mb layer using the volume browser.

Question 1. Examine the 00 UTC February 14 analysis through 00 UTC February 15. Where is the strongest QG upward vertical forcing located over the next 24 hours (through 00 UTC on the 15th)?

The fictitious graphical snowfall advisory you inherited is shown in Figure 1, valid for 2 AM-6 PM local time (08-00 UTC). Warning criteria in this CWA is 4 inches in 12 hours, or 6 inches in 24 hours. The previous shift felt the snowfall would be just below this threshold, but could be close to exceeding 3 inches in 12 hrs across the extreme southern part of the CWA along the Red River counties.

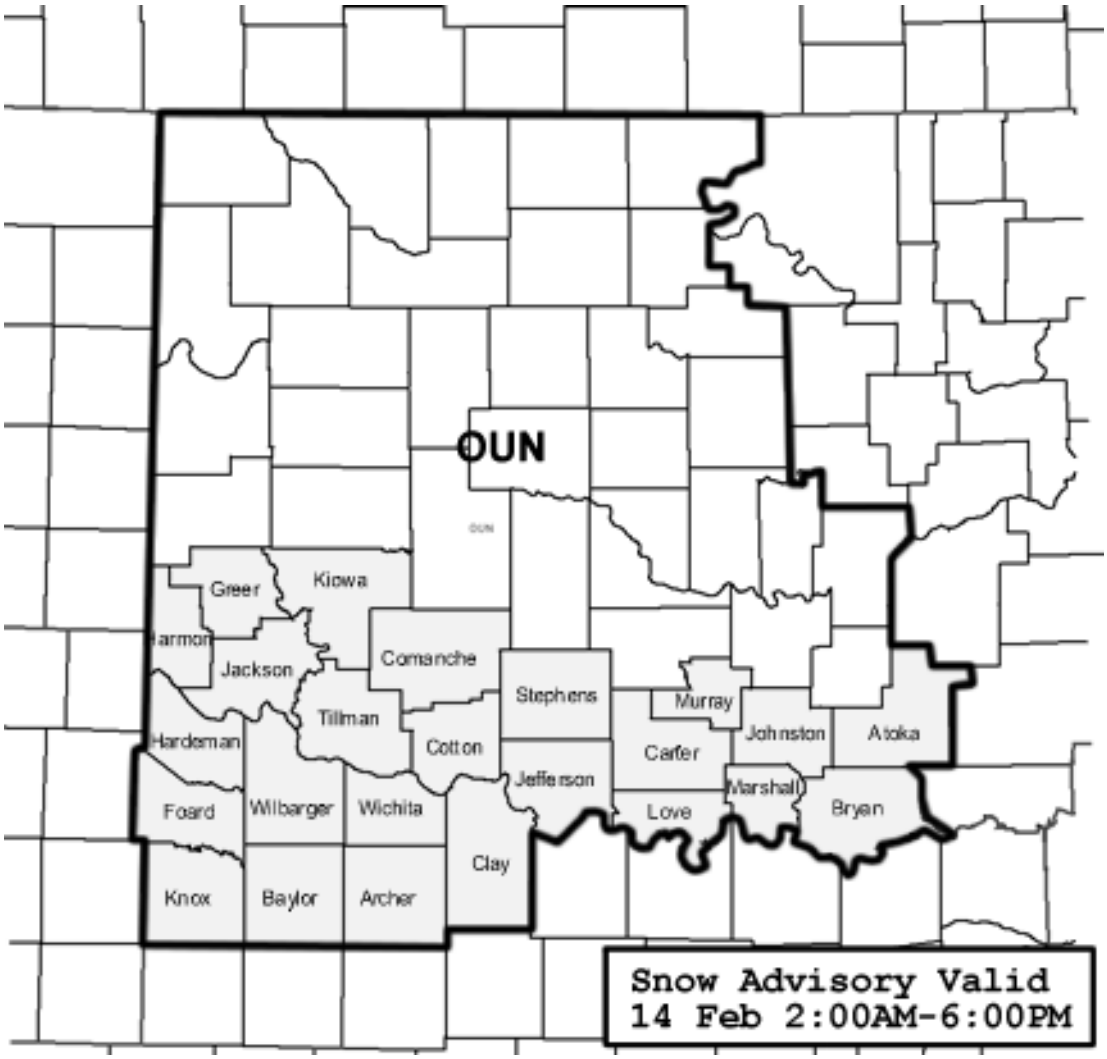

Figure 1. The snow advisory for the OUN CWA, valid 08-00 UTC on 15 February 2004.

Precipitation Diagnosis Methodology

Step 1: Monitor Surface Conditions

Following the methodology in the training module, you will move ahead to a time period during the snow advisory and evaluate the conditions to see if the snow advisory is still the proper product for this event. Set the clocks to 13 UTC 13 February 2004.

Load from the IC7Lesson4 procedure the set named **"NAM MSLP Metars"**, which loads in a single pane layout on the state(s) scale, load NAM40 MSLP and overlay metars.

Load from the IC7Lesson4 procedure the set named **"IR 500mb Heights"**, which loads IR satellite and overlay NAM40 500 mb heights.

Next, load from the IC7Lesson4 procedure the set named **"TLX, FDR and Metars"**, which loads 32-frame KFDR 0.5 reflectivity and toggled with KTWX 0.5 reflectivity and overlaid metars (since it was VCP32/31 with a 32 frame loop you can view ~5 hours of radar data). For a closer examination of the metars in hourly increments, load the set named **"METAR 6 radar frames"**. This loads metars first and overlays the reflectivity images in 1 hr increments.

Question 2. Does the location and intensity of the precip agree with what you saw in the 12 hr forecast from the NAM 80 in the previous step?

Step 2: Recognize Forecast Departure

Figure 2 shows the spotter reports that came in at 7:00 AM local time (also current D2D time), for snowfall totals since the current snowfall began overnight.

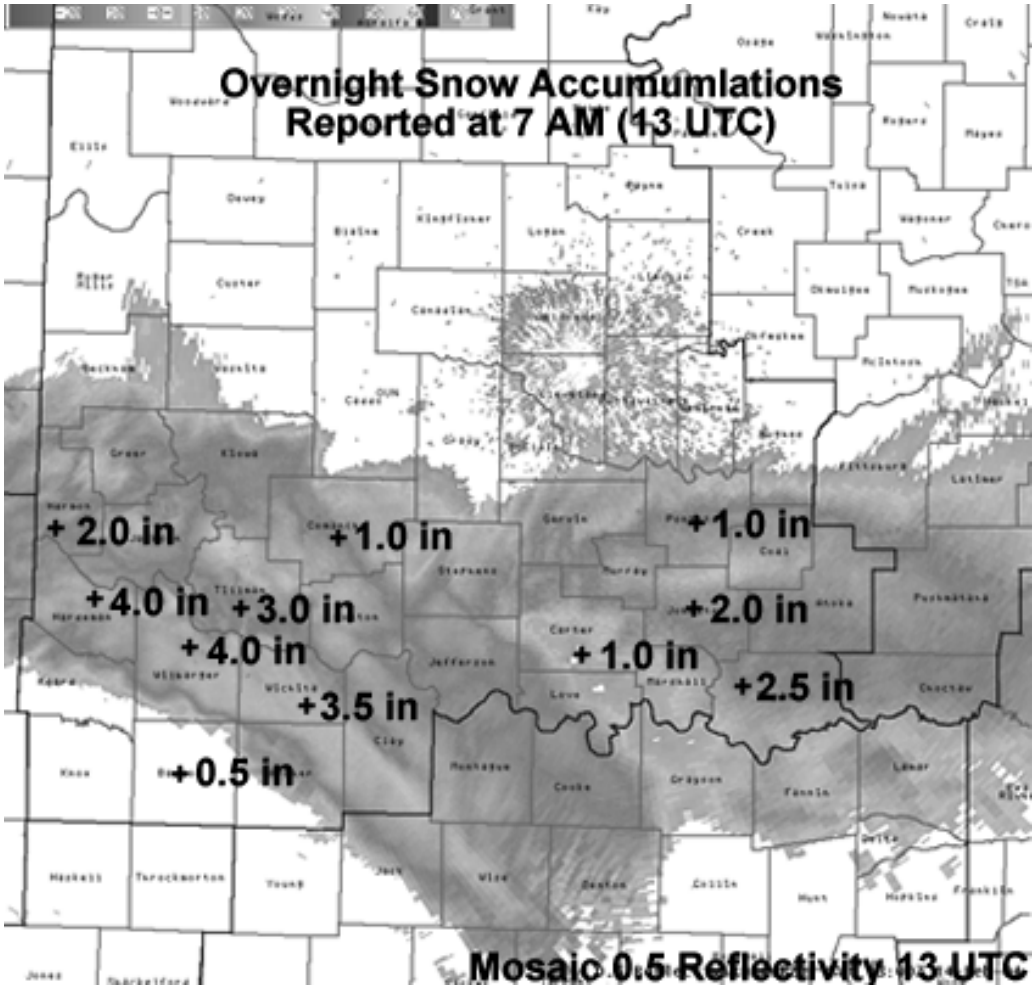

Figure 2. 14 February 2004 13 UTC 0.5 degree mosaic 8-bit reflectivity with overnight snow accumulations reported around 13 UTC overlaid.

Question 3. Are these snowfall totals consistent with the snow advisory currently in effect?

Question 4. Given current trends in radar, which counties will likely see additional snowfall exceed (or likely already has exceeded) warning levels?

Step 3: Diagnose Cause for Forecast Departure

Load from the IC7Lesson4 procedure the set named **"Meso Lift"**, which loads NAM 80 500 mb height, saturated EPV from 700-300 mb, 700-500 mb Div-Q, and 700 mb 2-D Frontogenesis in a state scale plan view window. So you are examining Div-Q in a nominal layer, overlay Div-Q at 500-300 mb. It may also be beneficial to overlay 700 mb frontogenesis from the NAM40.

To aid in answering question #5 below, you may want to load in a separate window the same products but in a different manner, using the set named **"dprog-dt Meso Lift"**. This loads all available model runs valid at 12 UTC on 14 February 2004. The data are NAM 80 500 mb height, saturated EPV from 700-300 mb, Div-Q 700-500 mb and 2-D Frontogenesis at 700 mb just as you did in the step above. As with the previous procedure, you will want to overlay 500-300 mb Div-Q and NAM40 Frontogenesis at 700 mb for comparison.

Question 5. Where is strong QG forcing coupled with frontogenesis, and is it stronger and/or positioned differently than previous model runs?

Using baseline A, set up a cross section through the maximum frontogenesis and along the region of strongest Q-vector convergence, roughly from central Texas north to north central Oklahoma. Then you can load from the IC7Lesson4 procedure the set named **"Xsection Line A"**. This set will load NAM 80 geostrophic momentum, θ_e, saturated equivalent potential vorticity, RH, 2-D Frontogenesis, Omega, and temperature ***along Line A only***, thus the importance of positioning Line A where you want it. For comparioson, overlay NAM 40 2-D frontogenesis. You'll have to toggle on and off combinations of products to answer the questions below.

Question 6. What do you notice about the location of the rising motion vs. area of frontogenesis?

Question 7. Is this cross section favorable for efficient snowgrowth in the dendritic growth zone? Where are these conditions most favorable?

Question 8. Is there any instability, and if so, is it favorably coupled with frontogenesis? Where is the instability greatest?

Step 4: Forecast Persistence

Using radar trends, metars, and the cross section analysis, analyze how long you expect the snow to continue across northwest Texas and southern Oklahoma, and which counties will be affected the most or longest. You'll need this information for the final step below.

Question 9. Snow likely to continue through _____UTC.

Step 5: Update forecast

On the original CWA Snow Advisory map provided, indicate where you would upgrade to a Heavy Snow Warning by drawing an **"X"** through the county. Then, draw total expected snow fall accumulation contours on the map. If you upgrade to a heavy snow warning, when will you set it to expire?

Question 10.HSW Expires at: _____ CST

An answer key is available for this job sheet. Please see your local AWOC Winter Weather facilitator to obtain a copy.